Lawrence Livermore National Laboratory

WCI 2030 STRATEGIC FRAMEWORK

WCI WEAPONS AND COMPLEX INTEGRATION

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Letter from the WCI Principal Associate Director

LLNL and WCI stand at a very exciting point in their history. The Stockpile Stewardship Program, now in its third decade, has met the challenge of ensuring the safety, security, and effectiveness of the enduring stockpile without new nuclear tests. We have built an incredible foundation of science, technology, and engineering tools and capabilities that have expanded our understanding and enabled us to begin a new epoch of this program. While we have largely relied on life extension programs to maintain legacy systems, we can now make necessary changes utilizing the tools of the Stockpile Stewardship Program to confidently meet military requirements, make production more cost-effective and efficient, and render the full lifecycle of a weapon more sustainable.

To ensure we can provide the capabilities the nation counts on to contribute to the deterrent in the face of an uncertain future, we must turn our attention to also modernizing the NNSA production enterprise. We must change the way we think about the whole process—from requirements to initial concepts through engineering, production, deployment, maintenance, operations, and, ultimately, disposition. We must also focus on two other critical elements: (1) delivery of science, technology, engineering, and production capabilities necessary not only to sustain the existing weapons but also to deliver needed modifications and the ability to create new systems in the future; and (2) the people who carry the expertise to advance our objectives and to assess the capabilities of others.

When I returned to WCI I asked three questions that, for me, frame the challenge and opportunity facing us today:

1. Can we drive the creation of a resilient, responsive, cost-effective, modern nuclear weapons enterprise that can anticipate and meet potential future threats?
2. Can we expand the design space over which we can certify with confidence without new explosive nuclear testing?
3. Can we make LLNL the career destination of choice for the very best scientists and engineers of the next generation?

These are not simple questions to answer, nor are they easy goals to achieve. But I firmly believe that WCI, and LLNL as a whole, are up to the task. LLNL was created to think differently, to challenge the status quo, to provide technically ambitious solutions and ‘Big Ideas’, and to back up these ideas with action. Our strength is manifested through our commitment to a whole-of-Lab approach and our flexible, agile, and excellent multidisciplinary workforce.

This strategy builds on that legacy and identifies the challenges that will motivate us over the coming decade. I hope you are as excited and energized about this journey as I am because we will only succeed together—Lawrence’s team for the 21st Century.

Kimberly S. Budil, Ph.D.
Principal Associate Director
Weapons and Complex Integration Principal Directorate

Summary

WCI's mission is to support U.S. strategic deterrence by assuring the safety, security, and effectiveness of the nation's nuclear weapons stockpile and by providing the science, technology, and engineering (ST&E) capabilities and experts required to enable and advance this essential responsibility. WCI's challenge is to ensure we can continue to serve our important role in national security in the face of a rapidly changing world and uncertain future.

More than twenty-five years after the inception of the Stockpile Stewardship Program (SSP), the security environment has changed substantially. In contrast to expectations at the end of the cold war, Russia continues to aggressively modernize its nuclear forces, reigniting the dynamics of a bygone era. The rise of China as a global economic power has allowed it to rapidly modernize its military, while also steadily growing and advancing its nuclear forces. The newfound era of great power competition with China and Russia, along with proliferant nations like North Korea, presents a new set of strategic challenges to the U.S. nuclear deterrent.

ST&E has dramatically advanced, with substantial investments in major facilities, computing, and potentially disruptive technologies around the world, particularly in China. International universities now challenge the U.S. as the destination for the best students, and high technology industries compete for the same talent as the national laboratories. A diminished U.S. defense industrial base has turned away from key areas upon which the nuclear weapons enterprise depends. The U.S. stockpile, its delivery platforms, and the NNSA production enterprise, already long past their planned service life, have endured two decades of caretaking with little modernization. These are the challenges that a comprehensive strategic plan must address.

Today, the national security landscape is increasingly multidomain in character, with nuclear, conventional, space, cyber, and other capabilities all playing a role. The suite of SSP capabilities built to sustain the nuclear deterrent provides important foundational capabilities for this much broader range of important national security missions. These missions range from nonproliferation, counterproliferation, counterterrorism, and intelligence analysis, to cybersecurity, space, biosecurity, critical infrastructure protection, and more. The interdependence of these missions requires stronger partnerships and collaborations and will challenge and enhance the judgement of our people and the quality of our tools.

To meet this moment, WCI must pursue a fundamentally new approach to ensure the success of the strategic deterrent into the future. We must embrace interdependencies across the nuclear security enterprise (NSE), as well as across domains, and redefine the relationships and interfaces that span this mission space. We must reimagine the entire lifecycle of nuclear weapons, from initial concept through design, engineering, production, deployment, surveillance, maintenance, and dismantlement with a focus on agility and sustainability of the system. And, most importantly, we must continue to drive ST&E innovation and nurture an exceptional workforce to provide resilience in the face of this uncertain future.

Our approach is framed by four overarching goals:

1. We deliver transformational deterrent capabilities in advance of the threat.
2. We partner effectively and drive innovation to achieve national security impact.
3. We are technical leaders in strategic fields, preeminent in computing, high-energy-density science, next-generation experimental technologies, energetic materials, and advanced manufacturing.
4. We are a magnet for the best people, who are inspired by our passion for mission and team-focused approach.

These four goals provide a strategic framework for thinking about the next decade and beyond and will guide our decision making. As a federally funded research and development center (FFRDC), Lawrence Livermore National Laboratory (LLNL) represents a unique U.S. asset to provide unbiased technical advice and innovative solutions across this full range of missions. LLNL is uniquely positioned to be the nexus of integration across these communities due to its responsibilities for the next two stockpile modernizations and its strong tradition of challenging the status quo, championing multidisciplinary team science and the competition of ideas, partnering effectively, and realizing imagined futures.

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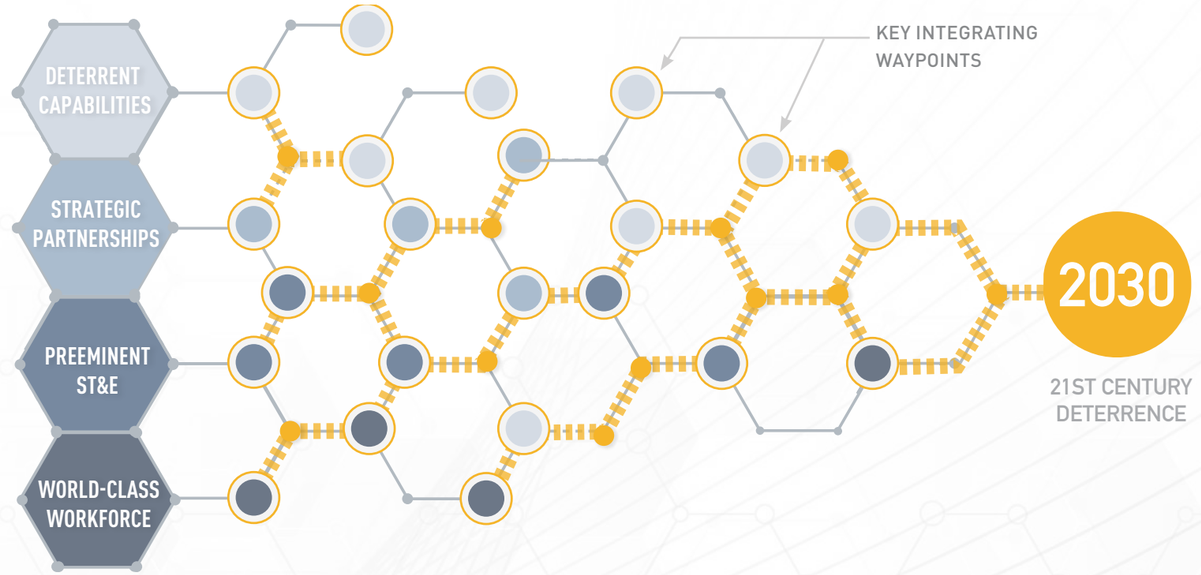


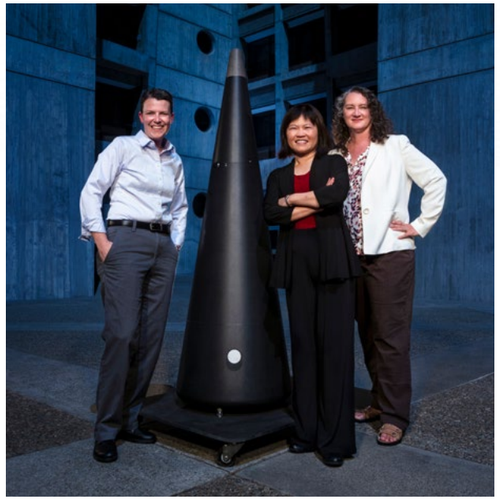
GOAL 1

We deliver transformational deterrent capabilities in advance of the threat.

We are committed to our core mission—to assure the U.S. nuclear weapons stockpile remains safe, secure, and effective—and acknowledge the challenges posed by an aging stockpile and an ever-widening gap between our design experience and the nuclear test era. The contemporary security environment, with multiple nuclear-armed major competitors, demands tailored, multidomain deterrence that addresses modernized nuclear and conventional forces and threat vectors such as space and cyber. Our charge now and in the future is to assure stakeholders that our people, capabilities, and infrastructure will respond to emerging threats and evolve the stockpile—at new speeds and with the necessary complexity to meet the need—to prevent others from achieving strategic surprise. Three objectives will support this goal in the decade ahead:

1.1 We continuously evaluate the state of adversary capabilities and emerging advances in ST&E.

The dynamism and complexity of the emerging security environment requires the ability to anticipate the moves of our adversaries and identify emerging technology opportunities. We must continuously assess the state of international ST&E as well as adversary offensive and defensive capabilities in order to understand their implications for the credibility and effectiveness of the U.S. deterrent. This critical work requires a strong partnership between the intelligence, analytic, and ST&E programs at LLNL and must become a cornerstone of our program. In the next decade, we will move from traditional intelligence assessments toward a more integrated, multidomain assessment approach that encompasses both offensive, defensive, and enabling capabilities. We will also actively participate in the international ST&E community, demonstrating our technical leadership, staying abreast of the state-of-the-art, and enabling ourselves to identify potential future challenges and opportunities. We will leverage strong partnerships with the civilian, military, and intelligence communities, working closely with them to develop suitable operating concepts and wargaming support necessary to maintain a credible and effective U.S. strategic deterrent.



LLNL is responsible for two major modernization programs underway, the W87-1 Modification Program (pictured) and the W80-4 Life Extension Program.

1.2 We sustain the current stockpile and expand the space of certifiability to provide an innovative range of options.

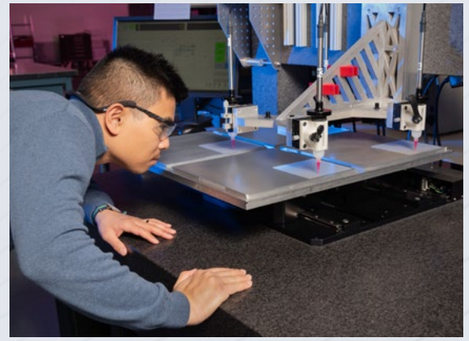
SSP has dramatically expanded our capabilities for design and assessment and significantly enhanced our understanding of the legacy stockpile. As this stockpile ages we will focus those capabilities increasingly on anticipating what future issues may arise and identifying or developing potential paths forward. To meet our strategic goals, our design capability must be seamlessly integrated within an agile and responsive complex to provide deterrent options. Our next challenge is to steadily move away from the narrow realm of the nuclear-tested current stockpile toward the ability to confidently, and rigorously, design and certify over the full space of options. In the coming years, we will evaluate changes in platforms and delivery vehicles to address a broader variety of environments and identify the improvements needed in our ST&E capabilities, including experimental, modeling, and simulation tools. We will hone our certification approach to enable the innovative options required for assessing and quantifying the impact of military requirements and understanding tradeoffs; establishing appropriate engineering tolerances to ensure manufacturability and maintainability; accepting new, altered, or standardized materials, components, or manufacturing techniques; and accommodating requirements for modularity, block upgrades, interoperability, or new environments. To transform options into solutions, we will develop cross-trained staff that bring forward innovative approaches, welcome constructive critique, and quantify and embrace risk.

1.3 We enable delivery from requirement to first production unit in less than 5 years routinely.

Global advances demand that we innovate faster and deploy modernized or new capabilities in time to stay ahead of our adversaries. To meet this objective in the next decade, we will fundamentally rethink the full lifecycle of a weapon system, from design concept through engineering, production, deployment, maintenance, surveillance, and ultimately disposition. We will revise business practices to favor speed, agility, responsiveness, and cost-effectiveness, enabling us to move routinely from emergent need to deployed capability within five years. To reach this goal, we will create and continuously update libraries of certifiable design solutions and develop components and modules to provide fast response and upgrade capabilities. We will invest in state-of-the-art manufacturing technologies for testing, prototyping, and production. And we will build a science and engineering program, along with rapid testing capabilities, to understand and quantify critical control parameters to support certification and performance-based manufacturing requirements, while minimizing testing needs, costs, and schedules. Our approach centers on a complex-wide culture where responsibilities, knowledge, and ownership of all aspects of the weapon development and realization effort are more widely shared. We will develop collaborative processes between and with partner Design and Production Agencies, and we will build and maintain resilient and trusted communication channels between DOE sites and with the DOD and its contractors. This sustained collaboration will yield technological progress to not only enable the responsive delivery of stockpile systems but to also reinforce the deterrent by demonstrating a continuous modernization of capabilities, nuclear and conventional, and advancing the skills of the workforce throughout the complex.

Accelerating Design-to-Deployment

One of our key challenges is finding new ways to bring modern technology into the Nuclear Security Enterprise to enable resilience and responsiveness. To meet this need, LLNL actively engages the production agencies to accelerate innovation and provide timely resolution of issues. A joint polymer production enclave being developed in partnership with the Kansas City National Security Campus is the next step in this process, envisioning expanded partnerships in which production agencies and LLNL staff work together to accelerate the design-to-deployment process. In such venues, we work collaboratively by leveraging our expertise in high-performance computing, simulations, materials, and digital engineering while balancing design and manufacturing constraints to dramatically speed up the product realization cycle.



WCI's partnership with the Kansas City National Security Campus successfully transfers designs into manufacture to accelerate polymer production for the W80-4 Life Extension Program. (Photo courtesy Kansas City National Security Campus)

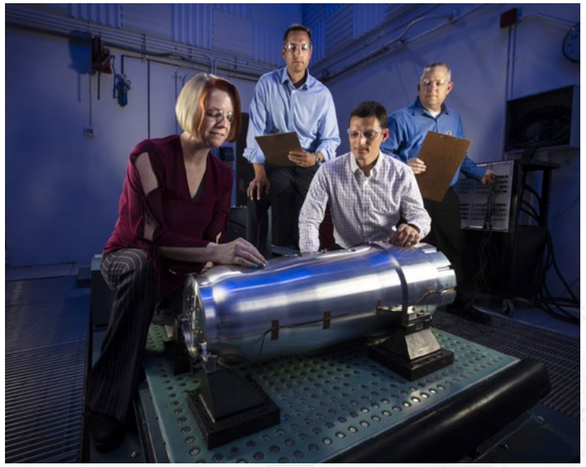
GOAL 2

We partner effectively and drive innovation to achieve national security impact.

To deliver future deterrent capabilities on the timescales required, we must change the way we work and the nature of our relationships within the NSE. In response to anticipated internal and external evolving threats, we must continuously pioneer new technologies and approaches and drive the development of integrated solutions that can anticipate and address the increasing complexity of potential multidomain, and multi-adversary, future crises. We will only succeed if the complex as a whole succeeds, and so we will build and maintain trusted partnerships across the NSE. These partnerships will enable us to understand, anticipate, and respond quickly to the internal NSE needs. We believe this mission requires us to have creativity and a fearless commitment to independent thought combined with dynamic enterprise-wide integration to achieve big wins for the nation. Three objectives support this goal as we look to the future:

2.1 We are trusted partners to the full spectrum of national security stakeholders.

Our technical efforts to advance the deterrent will succeed only if we build and sustain trusted partnerships with the full spectrum of nuclear and national security stakeholders. To become trusted partners, we must first understand the relationship between ourselves, our partners, and our stakeholders. We will identify key contacts inside and outside of WCI to establish a constant and thoughtful engagement, listening first as we seek to understand our partners' needs, challenges, and concerns. We will build trust by providing honest, unbiased technical assessments without regard to other interests, delivering on our commitments, constantly seeking feedback, and performing self-assessments on our approach. We will operate as one team across LLNL, and as a key member of the broader NSE team, actively developing our staff to demonstrate a culture of transparency, integrity, and honesty to stakeholders and partners. We will use the breadth offered by our support to a wide range of missions to strengthen, advance, and challenge both our relationship approach and our people.



The W80-4 Life Extension Program represents a close partnership with stakeholders across the nation to drive innovative solutions.

2.2 We are agile, enterprise-wide partners who respond to the needs of national security stakeholders.

To have our desired impact on national security, we must anticipate and respond on relevant timescales. To achieve this objective, we will understand previous successes in, and challenges to, WCI collaborations both within LLNL and within the NSE complex as well as identify issues and execute a strategy to address priority concerns. We will draw teams together to address emerging challenges, be prepared to change our priorities in times of need, learn fast, manage the associated risks, and constantly assess and revise our practices. We will develop the necessary flexible and adaptable capabilities and infrastructure that will enable future collaborations and that can evolve as needs change. This will create opportunities to rapidly develop and mobilize our multidisciplinary teams to deploy their understanding and skills to deliver high impact solutions through effective partnerships. Our partnership objective is to lead where appropriate and be a trusted, collaborative, and strong team member always.

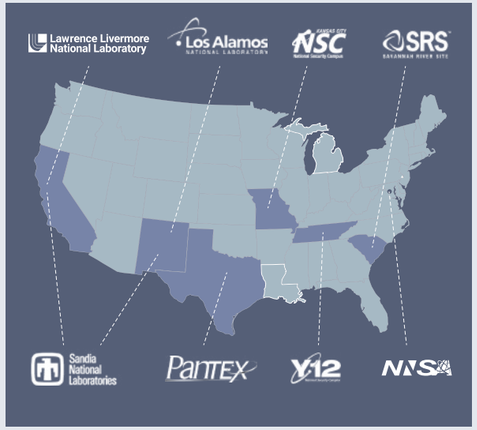
2.3 We are independent thinkers who generate innovative solutions and build enterprise-wide partnerships to achieve big wins.

We believe that delivering innovative technical solutions to advance the national security mission requires a fearless commitment to independent thought, a dedication to building and sustaining enterprise-wide partnerships, and a willingness to take risks. Innovation and impact are hallmarks of LLNL, and we must ensure they remain at our strategy's core. We will, therefore, establish an Innovation Hub to work across WCI programs to ensure our staff are aware of the challenges facing our stakeholders, are able to develop and cross-fertilize their ideas both inside and outside of WCI, and actively nurture and support innovative ideas. In this complex landscape of multidomain deterrence, we must anticipate challenges to deterrence but also challenge ourselves to reevaluate how we work and seek innovative ways to deliver big wins for the Laboratory, the enterprise, and the nation. To achieve these wins, we must rethink fundamental elements of the enterprise and change it in revolutionary ways. This will require that we leverage our full spectrum of capabilities, existing tools, creativity, and scientific and engineering prowess, and that we deliver through our exercised enterprise-wide partnerships.

Modernization programs such as the W80-4 Life Extension Program will focus on speed, agility, responsiveness, and cost-effectiveness, enabling rapid deployment of new capabilities within five years.

Modeling the Nuclear Security Enterprise

Anticipating and responding to potential threats requires an enterprise-level view encompassing partners' assets and capabilities. By investigating potential changes across the enterprise, we can pinpoint discrepancies and unanticipated consequences to better prepare stakeholders as they plan for the future. The LLNL-designed Nuclear Weapons Enterprise Modeling Suite supports strategic decision-making across the NNSA complex with a comprehensive database linking information on enterprise-wide assets including buildings, personnel, and weapons. These models enable stakeholders to project the impact of decisions such as replacing, versus repairing, a facility or hiring scientists for a new weapons program. Models such as these heighten our agility in the moment and support our vision for the future.



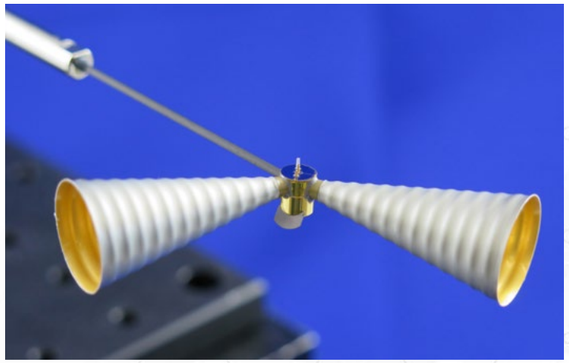
The National Nuclear Weapons Enterprise Modeling Suite links information enterprise-wide to support strategic decision-making across the NNSA complex.

GOAL 3

We are technical leaders in strategic fields, preeminent in computing, high-energy-density science, next-generation experimental technologies, energetic materials, and advanced manufacturing.

The fundamental premise of the SSP was sound: expert judgment informed by the integration of computing and experimental data had always underwritten the deterrent. With the dramatic advances in experimental and computational capabilities required to make the SSP a reality, WCI gained tremendous insights into the science and engineering of an operating nuclear weapon. These technical capabilities are among the beacons that draw outstanding talent to the laboratory to pursue a career in national security and are a signal to our adversaries that we are innovative and agile in response to new challenges.

The democratization of science over the past three decades makes innovation and technical leadership in the core technical fields associated with strategic deterrence even more essential today than at the dawn of the SSP. And, for a select few areas, nothing short of preeminence is our goal. In high-performance computing (HPC) and high-energy-density (HED) science, we will remain not only leaders but pioneers, shaping the international landscape with our work. In next-generation experimental technologies and energetic materials, our legacy of excellence will be harnessed to shape those future capabilities and expertise. Finally, in keeping with our founder's vision of a 'Big Ideas' lab, we will continuously explore emerging technologies, such as additive and advanced manufacturing, to drive game-changing advances for our mission. Five objectives guide our actions toward this goal:

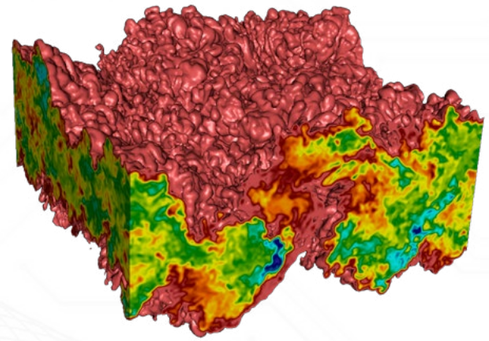


LLNL's National Ignition Facility, the flagship experimental facility for the Stockpile Stewardship Program, enables study of weapon conditions.

3.1 We are global leaders in HPC enabled by our powerful and efficient modeling and simulation ecosphere integrating multi-physics models, cognitive simulation, multiscale modeling, and advanced computing architectures.

LLNL's global leadership in HPC fosters tightly integrated code, platform, and computer center evolution combined with an external web of industrial R&D partnerships looking more broadly than the next platform acquisition. Over the coming decade, we will both modernize and double down on this model, focusing on a dramatic advance in designer productivity and agility to deliver powerful tools supporting our response to national deterrence challenges.

In the face of stagnating platform peak speeds, we will leverage advances in machine learning (ML), artificial intelligence (AI), and cloud computing, creating a force multiplier for our designers. We will develop and assemble the building blocks needed to create a Virtual Design Assistant to free subject matter experts from intensive, process-based simulation workflows, enabling a focus on higher, mission-driven questions. A Center of Excellence in AI will reach across LLNL programs, as well as industrial partners, to enable co-design and collaboration with WCI experts in developing next-generation software and hardware technologies that reap maximal benefit from enormous industrial investment. Through these means we will advance AI-guided simulation tools and processes to leverage new computer architectures and algorithms to achieve the level of fidelity, spatial resolution, automation, and turnaround time demanded by the agile workforce we must enable.



Multiphysics models, such as this 3D Eulerian investigation, advance state-of-the-art simulations and inform advanced manufacturing solutions.

3.2 We are the global vanguard of HED physics and have established the vision and plan for a high-yield-fusion facility.

Director Emeritus John Nuckolls' bold vision for inertial confinement fusion (ICF), spurred by the invention of the laser in 1960, launched the field of HED science and laid the foundation for the National Ignition Facility (NIF) to serve as a flagship experimental facility for the SSP. NIF produces unprecedented pressures, densities, and temperatures, which when coupled with advanced diagnostics, enable higher-fidelity study than ever before of weapon-relevant conditions to directly inform stockpile decisions. To meet the needs of the future deterrent, we must enable impactful assessments utilizing HED capabilities on a rapid timescale, including striving to achieve ignition and paving a path to high fusion yields to address an ever-broader range of weapon questions and uncertainties. In addition, we must meet the challenges of an evolving landscape as more institutions and more countries aggressively engage in the field of HED science.

To address these challenges over the next decade, we will aggressively advance HED experimental and computational research to anticipate SSP needs so that experienced staff can produce the data to readily address stockpile questions within one year. We will deliver the understanding needed to achieve ignition and high yield through an ignition effort focused on integration with the broader nuclear weapons enterprise. We will also commence and lead the development of an expedited, cost-effective, national plan to assess potential technology paths to high fusion yield. LLNL's international leadership in HED science, ICF, and laser development attracts, trains, retains, and challenges

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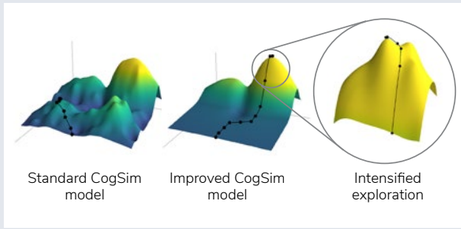
Applying Cognitive Simulation

The Stockpile Stewardship Program (SSP) relies on high-performance computing (HPC) simulations to model relevant experiments. As a leader in HPC applications, LLNL has advanced cognitive simulation (CogSim)—the convergence of machine learning with high-fidelity modeling and simulation—to refine predictive models used to meet LLNL's national security mission. CogSim leverages deep neural networks that can be trained to replicate high-fidelity physics at a fraction of the traditional computational cost. Post-processing analysis by the neural networks can combine information from many simulations with available experimental data to produce more accurate predictions, quantify uncertainties, and help guide the choice of future experiments and diagnostics. These capabilities converge to reduce overall uncertainties, building confidence in the deterrent now and in future weapon designs.



As indicated in a comparison of a standard model (left) with improved CogSim (middle) and intensified exploration (right), CogSim yields more accurate predictions and uncertainty quantification than standard models.

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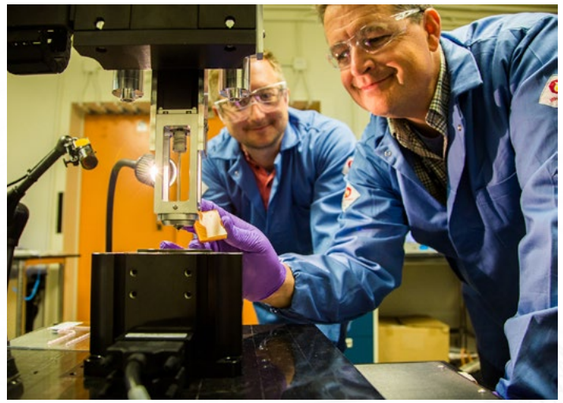
world-class scientists, engineers, and technicians, greatly expanding the visibility and impact of our work, and future efforts will develop a purposeful set of partnerships and engagements to leverage fully both national and international HED efforts.

3.3 We innovate and deliver revolutionary enabling experimental capabilities.

LLNL's multidisciplinary teams have long pursued high-risk, high-reward research by combining premiere science with world-class engineering to develop revolutionary capabilities. Our need for new and higher precision types of data, to create and diagnose the most extreme states of matter, and to continually push the state-of-the-art in experimental science requires that we empower our scientists and engineers with more flexibility to pursue high-risk, high-reward ideas and pursue strategic external partnerships to leverage the best expertise. Our portfolio will cover experimental platforms, targets, drivers, and diagnostics with an emphasis on new technology options for a high-fusion-yield facility, advanced radiography concepts using both lasers and pulsed power, and advanced HED capabilities to support emerging needs in survivability, modern manufacturing, and hypersonics.

3.4 We create and apply energetic materials uniquely tuned to the application.

LLNL has delivered first-of-a-kind explosive materials, developed the first reactive flow and thermochemical explosive models, and pioneered the use of additive manufacturing for explosive components. LLNL's explosive model libraries are the standard used by hundreds of DOD analysts. Building on this legacy is central to the challenges we face as we look toward the 2030s and beyond. Meeting requirements for future systems will likely require higher performance and/or improved safety relative to current explosive formulations, and aggressive schedules will require high explosives (HE) production on much shorter timescales.



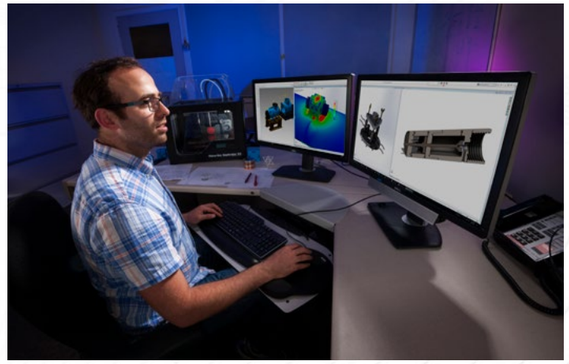
LLNL's additive manufacturing expertise delivers tunable energetic materials that can be rapidly developed.

To address this challenge, we will greatly enhance our scientific understanding and modeling of HE safety and performance, validated by advanced diagnostics on focused HE experiments, to reduce weapon system certification schedule and cost. This includes developing strong partnerships with the HE production agencies (PA) to utilize this understanding to develop a more consistent approach to HE production, including improved trade-offs between HE performance and safety. We will also address increasing the efficiency of operations throughout the NNSA complex and DOD sites through the improved understanding of HE safety and response.

3.5 Our collaborative production innovation hubs are at the epicenter of discovery and development of manufacturing technology and its responsive deployment.

Today, LLNL is a world leader in advanced manufacturing technologies with partnerships across the NNSA complex, industry, and academia. We have introduced disruptive techniques that, while enabling unique designs and reducing manufacturing cost and time, only scratch the surface of potential transformations to the future design and manufacture of nuclear weapons. In the next decade, we will pursue an integrated, collaborative approach to yield a responsive manufacturing infrastructure at LLNL and throughout the broader NSE capable of taking a component from design to deployment in less than three years. This rapid timeline will be enabled by understanding and innovating materials and feedstocks and developing new manufacturing platforms. Our HPC modeling and simulation capability will be coupled with our advanced manufacturing to dramatically accelerate the innovation cycle. We will enhance the use of automation and data science, deploy in-situ sensing, and develop process-aware inverse design methods. Finally, we will vigorously pursue technology maturation and transfer, in partnership with NNSA production sites and industry.

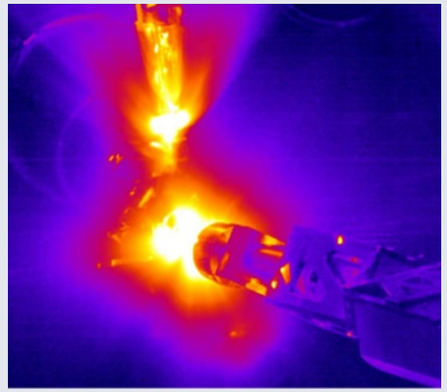
We will make these advancements possible by establishing collaborative manufacturing innovation hubs focused on discovery, development, and responsive deployment of manufacturing technologies. These hubs will be designed around enhanced connections between system design and manufacturing such as manufacturing-informed design optimization at the component level. As novel, non-intuitive component designs and advanced manufacturing processes become standard, these hubs will allow R&D and production to be conducted in parallel with automation and data-driven approaches used to accelerate the manufacturing cycle.



Enhanced connections between system design and manufacturing, coupled with LLNL's preeminence in high-performance computing, will accelerate the deployment of mission-critical technologies.

Achieving Weapon Conditions

LLNL's leadership in high-energy-density (HED) science, inertial confinement fusion (ICF) experiments, laser technology, including the world-leading National Ignition Facility, and sophisticated simulations provides answers to stockpile questions today and supports our pursuit of ignition. Rather than a final goal, ignition will support a path to high-fusion yield, which will enable even higher-fidelity testing of weapons physics. To meet the needs of the stockpile today and prepare for the future, WCI has merged our HED science and ICF efforts for greater innovation and impact. We also seek to enhance partnerships within the Lab and with our partners at Los Alamos National Laboratory, the Sandia National Laboratories (home of the Z Facility), and the University of Rochester (home of the Omega laser). Together we will advance our understanding to better anticipate and mitigate future threats and deliver on weapon modernization in ever-faster cycles.



Experiments at the National Ignition Facility achieve the high temperature and pressure regimes required to investigate weapon relevant conditions.

GOAL 4

We are a magnet for the best people, who are inspired by our passion for mission and team-focused approach.

The quality, judgment, and innovation of our people are not only a critical element in achieving our strategic goals but also a foundational component of the deterrent itself. Successful execution of our strategy relies on the very best and brightest choosing to join WCI, staying and participating in our outstanding teams, and working in nationwide partnerships to deliver the innovative work that our nation needs. Three core objectives support this goal:

4.1 We nurture our staff's career growth in support of excellence.

Excellence in all we do requires staff with both broad perspectives and deep expertise in their fields. We therefore enable our workforce to have flexible and diverse careers without barriers to changing disciplines, programs, and projects, and we provide opportunities to support a range of our important missions. We will meet future challenges through world-class training programs that mix strong education, job rotations, on-the-job training, and off-site assignments. We will ensure our leaders and staff have the resources and skills, both technical and managerial, to effectively deliver for the program and support the development of our staff, including mentorship programs for all. Perhaps most importantly, we will actively take advantage of opportunities in other organizations, both internal and external, for their ability to provide new skills, experiences, and growth. Developing a workforce that understands the role, strengths, and challenges of deterrence and the national security context will be a priority.

WCI is strengthened by diversity in all dimensions, including discipline, experience, gender, and race among others.

4.2 We support mission delivery by rewarding innovation and initiative.

In keeping with our heritage as the 'Big Ideas' lab, we seek to ignite the spirit of innovation within our workforce and enable our people to think beyond the near-term challenges. We will nurture breadth and depth in our workforce so they can take on broad and complex challenges. We will create venues for all staff to innovate, integrate with their peers, and share new ideas. We will have established mechanisms to foster ideas that show promise. We will encourage collaboration and discuss our innovations with a wide variety of audiences to invite feedback on our ideas and work. Furthermore, we will develop staff to actively manage risk, rather than seek to eliminate it, and we will recognize and reward innovations that strive to enhance our impact on our mission, whether they are ultimately successful or not.

4.3 We are renowned for our diverse workforce, equitable and inclusive environment, and commitment to teamwork to make a lasting impact on our missions.

LLNL's namesake Ernest O. Lawrence championed diverse, multidisciplinary teams as a means to tackle the most complex challenges, and we will build on that tradition. We will value tolerance and diversity, in all its forms, in our teams. We understand that seeking out, and drawing on, a wider range of experiences leads to the broadest set of options and the best results. We will support internal and external partnerships and leverage the expertise and capabilities of others enhancing our agility and responsiveness. To deliver lasting impact on national security also requires we engage with a wide range of stakeholders, including LLNL organizations, the broader NSE, professional and academic organizations, and industry. We must learn to build and value long-standing relationships and to openly demonstrate our commitment to collaborations and partnerships. These relationships can be leveraged not only to grow collaborations and partnerships but also to strategically recruit and build our diverse workforce. This approach along with our passion for mission, commitment to innovation, and record of successful impact in national security will be a magnet that helps us attract, recruit, and retain the very best talent to WCI.

Promoting STEM advancement through summer students and post-doctoral programs helps attract strong candidates to join our workforce.

Developing Nuclear Weapon Experts

With the recent focus on delivering stockpile modernization, programs are emerging to develop a diverse cadre of nuclear weapon experts to support the national security enterprise through an uncertain future. WCI's new training approach cultivates the required design expertise by combining broad, formal courses, project-based training, and scaled mentoring to develop technical breadth, depth, and soft skills to nurture career growth and advancement. In addition, national initiatives like the Stockpile Responsiveness Program enable the development of the required science and engineering skills in the next generation of nuclear stockpile experts. Utilizing these opportunities to exercise key capabilities and skills not only creates a mechanism to preserve and transfer knowledge across the Nuclear Security Enterprise but also strengthens the deterrent.

WCI's Training program will shape our future weapon system experts and enable them to meet the challenges of the future.

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